Remarks

Reconsideration is requested in view of the above amendment and the following remarks. Claims 1-3 are amended. Claims 1-9 are pending.

The amendments to claims 1-3 are supported by the original disclosure, for example page 8, lines 29 to 30; page 9, lines 1 to 4; page 12, lines 20 to 21 and 29 to 32; and page 17, lines 26 to 27; and page 17, line 35 to page 18, line 1.

Applicants would like to thank the Examiner for the telephone interview conducted on May 6, 2003 with Applicant's representative, James A. Larson. During the interview, claims 1-3 and the Hirata et al. patent (US 5,485,308) were discussed. During the interview, Applicants explained why the original disclosure does support recitation of "lengthwise axes", pointing to the reasons already made of record. No agreement was reached concerning the allowability of any claims.

Drawings

In the action, Applicant's proposed drawing correction was approved by the Examiner. The Examiner also required that corrected drawings incorporating the proposed drawing corrections be filed at this time. Formal drawings incorporating the proposed changes were submitted on February 28, 2003. Entry of those drawings is requested.

In addition, the Examiner has objected to the drawings for allegedly not illustrating lenticular lenses that are arranged so that the lengthwise axes thereof are directed in a vertical direction. Applicants respectfully traverse.

Claims 1 to 3, as amended, each recite that lenticular lenses that are arranged so that the lengthwise directions thereof are directed in a vertical direction. The original description describes Figures 1, 3 and 5 as being plan views (see, e.g., page 8, lines 29 to 30; page 12, lines 20 to 21; and page 17, lines 26 to 27). In addition, the original description describes the CRT's 201, 202, 203 (Figure 1); 301, 302; 303 (Figure 3); and 401, 402, 403 (Figure 5) for the red, blue, and green color images in Figures 1, 3 and 5 as being "linearly aligned in a horizontal direction" (see, e.g., page 9, lines 1 to 4; page 12, lines 29 to 32; and page 17, line 35 to page 18, line 1).

Therefore, based on the original disclosure, Figures 1, 3 and 5 are views of the rear projection image displays in which the viewing direction coincides with the vertical direction. In

other words, Figures 1, 3 and 5 are views in which the vertical direction extends into and out of the sheet when viewing the respective figure, and the horizontal direction is in the plane of the paper.

As a result, the drawings do illustrate lenticular lenses having lengthwise directions that are directed in a vertical direction.

35 USC 112

Claims 1-9 are rejected under 35 USC 112, first paragraph, for containing new matter. In particular, the rejection asserts that there is insufficient disclosure in the specification and drawings for reciting lenticular lenses that are arranged so that the lengthwise axes thereof are directed in a vertical direction. Applicants respectfully traverse.

Claims 1 to 3, as amended, each recite that lenticular lenses that are arranged so that the lengthwise directions thereof are directed in a vertical direction.

During the above-referenced interview, the Examiner suggested that "lengthwise axes" was not supported because "lengthwise axes" could also mean the optical axes of the lenticular lenses, which the Examiner considers to be horizontal, as well as a vertical direction.

However, as is well known to those skilled in the art, lenticular lenses are a group of lenses having cylindrical circumferential surfaces with uniform radii. The lenses are arranged in parallel with each other so that the central axes of the cylindrical circumferential surfaces are arrayed at uniform intervals. Thus, the language "lenticular lenses" means a certain type and arrangement of lenses.

Further, as discussed above with respect to the drawings, the drawings illustrate plan views of the image displays. Being plan views, it is inherent that the lengthwise directions of the illustrated lenticular lenses are directed in a vertical direction. In addition, original claims 1 to 3 recited "light-incident-side lenticular lenses for converging incident light from the collimating means in a horizontal plane". In order for the lenticular lenses to converge incident light in a horizontal plane, the lenticular lenses have to be arranged so that their lengthwise directions are directed in a vertical direction.

Therefore, the language in question is supported by the original disclosure.

35 USC 102 and 35 USC 103 rejections

Claims 2-9 are rejected under 35 USC 102(b) as being anticipated by Hirata et al. (US Patent 5,485,308). Applicants respectfully traverse this rejection, and reconsideration is requested.

In addition, claims 1 and 4-9 are rejected under 35 USC 103(a) as being unpatentable over Hirata et al. (US Patent 5,485,308) in view of Dubin et al. (US Patent 6,278,546). Applicants respectfully traverse this rejection, and reconsideration in requested.

Claims 2-9

With respect to claims 2-9, claims 2 and 3 recite, among other features, a color-shading eliminating means having, on its light incident surface, light incident side lenticular lenses arranged so that the lengthwise directions thereof are directed in a vertical direction for converging incident light from the collimating means in a horizontal plane.

Hirata et al. discloses a rear projection type display apparatus that includes a rear projection screen 1 comprising a Fresnel lens sheet 2, a first lenticular lens sheet 3 and a second lenticular lens sheet 4. In one embodiment, the lenticular lens sheet 3 includes lenticular lenses on the incident and exit sides (Fig. 33). In the embodiments disclosed by Hirata et al., the lenticular lenses on the lens sheet 3 are arranged horizontally to diffuse light rays in the vertical direction (col. 7, lines 26-27 col. 14, lines 19-24; col. 23, lines 49-59).

The light incident side lenticular lenses of Hirata et al. on the sheet 3 are horizontal, not vertical as is required by claims 2 and 3. The office action refers to column 7, lines 14-33 of Hirata et al. as teaching lenticular lenses with axes arranged vertically on the sheet 3. Applicant's respectfully submit that this passage in Hirata et al. has been misconstrued.

Column 7, lines 16-19 states "the first lenticular lens sheet...a plurality of aspherical horizontally elongated lenticular lenses having a longitudinal direction corresponding to the screen horizontal direction are arranged in the screen vertical direction". This arrangement is clearly shown in Figure 13 of Hirata et al., where the longitudinal axes of the lenticular lenses are arranged horizontally, but the lenses also take-up the vertical extent of the sheet 3 (i.e. there are lenses on the entrance surface 31 from the top of the surface 31 to the bottom of the surface 31). This arrangement is also clearly described at column 12, lines 42-47 of Hirata et al., where

the horizontal lenticular lenses of the sheet 3 are said to be arranged in a continuous vertical arrangement.

Thus, the language at column 7, line 19 of Hirata et al., namely "arranged in the screen vertical direction" is describing the fact that the lenticular lenses of Hirata et al. are arranged in a continuous vertical arrangement on the first lens sheet 3 (i.e. the lenses take-up the entire surface from top to bottom), and is not describing the directions of the lenses as being arranged vertically. That this is the correct interpretation is supported by the fact that the lenses of the first lens sheet cannot have both a longitudinal direction corresponding to the screen horizontal direction, as is described, and at the same time have a longitudinal direction that extends vertically. In addition, Hirata et al. discloses that the first lens sheet diffuses light rays in the vertical direction. The lenses of the first sheet 3 cannot diffuse light rays in the vertical direction if the axes of the lenses are arranged vertically as well. Column 7, lines 20 to 25 describe the vertical arrangement of the lenticular lenses of the second lens sheet, and does not apply to the first lens sheet 3.

There is no disclosure in Hirata et al. of the lenticular lenses of the lens sheet 3, which the rejection characterizes as a color-shading eliminating means, as being arranged in a vertical direction.

Further, claims 2 and 3 recite that the lenticular lenses of the color-shading eliminating means and lenticular lenses of the light diffusing means converge light in a horizontal plane. In other words, all of the lenticular lenses of the color-shading eliminating means and the light diffusing means are arrayed in directions parallel with one another.

In Hirata et al., the lenticular lenses of the first lens sheet 3 are arrayed in directions perpendicular to the lenticular lenses of the second lens sheet 4. Therefore, as illustrated in Figure 33 of Hirata et al., the lenticular lenses of the first sheet 3 are arranged to converge light in a vertical direction, while the lenticular lenses of the second sheet 4 are arranged to converge light in a horizontal direction, opposite the direction of the first sheet 3. Nor is there any suggestion in Hirata et al. to arrange the lenses of the two sheets parallel so that each sheet converges light in a horizontal plane.

During the above-referenced telephone interview, the Examiner suggested that rotation of Figure 33 of Hirata et al. by 90 degrees would result in vertical lenses. This is not correct. First, there is no suggestion in Hirata et al. to rotate the arrangement in Figure 33. However, even if

Figure 33 is rotated as suggested by the Examiner, the invention in claims 2 and 3 does not result. If Figure 33 were rotated 90 degrees, the lenses on the first sheet 3 would then be vertical to converge light in a horizontal plane, while the lenses on the second sheet 4 would then be horizontal to converge light in a vertical direction. The lenses on the sheets 3 and 4 remain perpendicular to each other. Therefore, even rotating Figure 33 as suggested by the Examiner, Hirata et al. does not teach a color-shading eliminating means and a light diffusing means with lenticular lenses that converge light in a horizontal direction.

Nor is there any suggestion to rotate just the first sheet 3 in Hirata et al. while the remaining components in Figure 33 remain the same.

As a result, Hirata et al. does not teach a color shading eliminating means having light incident side lenticular lenses that are arranged so that the lengthwise axes thereof are directed in a vertical direction for converging incident light from the collimating means in a horizontal plane, or lenticular lenses of the color-shading eliminating means and lenticular lenses of the light diffusing means converging light in a horizontal plane.

Therefore, Hirata et al. does not anticipate or render obvious claims 2 or 3, or any claims depending therefrom.

Claims 1 and 4-9

With respect to claims 1 and 4-9, claim 1 recites, among other features, a color-shading eliminating means having, on its light incident surface, light incident side lenticular lenses arranged so that the lengthwise directions thereof are directed in a vertical direction for converging incident light from the collimating means in a horizontal plane.

Moreover, in claim 1, the light diffusing means comprises a plurality of micro beads provided on the light incident surface of the substrate sheet, and light transmitting portions formed between the substrate and the micro beads. Therefore, in the light diffusing means claimed in claim 1, light passes through the micro beads, the light transmitting portions, and the substrate sheet in that order.

In the display defined in claim 1, the colored lights are incident on a transparent screen at different angles on one horizontal plane. With the arrangement of the lenticular lenses claimed in claim 1, the color shading eliminating means is capable of converting the principal rays of the three colored lights into rays substantially parallel to one another. Thereafter, the rays enter the

light diffusing means from the side of the micro beads. As a result of the invention claimed in claim 1, it is possible to display images with little degradation of contrast by external light, with an increased angle of visibility, and with less color shading, without a decrease in the light utilization efficiency (see, e.g., page 6, lines 28-37).

Hirata et al. is discussed above with respect to claims 2 and 3. As explained above, Hirata et al. does not teach light incident side lenticular lenses on the sheet 3 that are vertical. Therefore, the light incident side lenticular lenses on the sheet 3 of Hirata et al. do not converge incident light from the collimating means in a horizontal plane. In fact, Hirata et al. discloses exactly the opposite, i.e. the lenses on the sheet 3 are horizontal so that the first lens sheet diffuses light rays in the vertical direction. Further, Hirata et al. does not teach a light diffusing means comprising micro beads.

Dubin et al. discloses a display screen for a projection display. The screen includes a lenticular array structure that includes spheres 80 embedded in a light blocking layer 81 forming effective apertures 82, and a substrate 85 (Fig.8; col. 11, line 56 to col. 12, line 5). As described in Dubin et al., the lenticular array in Figure 8 is used in a manner such that projected light enters from the substrate 85 side through the effective apertures 82, and exits the spheres 80 to the right (col. 12, lines 16-29).

Dubin et al. does not remedy the deficiencies of Hirata et al. Dubin et al. does not teach light incident side lenticular lenses that are arranged so that the lengthwise directions thereof are directed in a vertical direction to converge incident light from the collimating means in a horizontal plane. Further, Dubin et al. does not teach a light diffusing means with a plurality of micro beads on the light incident surface of a substrate sheet. The beads of Dubin et al. are instead on the exit side of the substrate sheet.

Therefore, in Dubin et al., much of the projected light is blocked by the light blocking layer 81. As a result, the light utilization efficiency is decreased. At the same time, the contrast can be degraded by external light. Furthermore, only the light rays that have passed through the effective apertures 82 are subjected to refraction when exiting the spheres 80, which impacts the diffusion effect of the light rays. As a result, a wide angle of visibility cannot be achieved.

Thus, even if combined, Hirata et al. and Dubin et al. do not teach or suggest the invention recited in claim 1. The combined teachings of Hirata et al. and Dubin et al. do not suggest a color-shading eliminating means having light incident lenticular lenses on its light-

incident surface that are arranged so that the lengthwise directions thereof are directed in a vertical direction to converge incident light from the collimating means in a horizontal plane, and a light diffusing means with a plurality of micro beads on the light incident surface of a substrate sheet, nor do these references teach the advantages that arise from the claimed arrangement.

For at least these reasons, claim 1 and claims 4-9 depending therefrom, are patentable over Hirata et al. and Dubin et al. Withdrawal of the rejection is requested.

Conclusion

Applicants believe that the application is in condition for allowance. Favorable consideration is respectfully requested. If any further questions arise, the Examiner is invited to contact Applicants' representative at the number listed below.

Respectfully Submitted,

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